Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

A Stochastic Path Integral Formulation for Continuous Quantum Measurement AREEYA CHANTASRI, JUSTIN DRESSEL, ANDREW JORDAN, Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627, USA — We consider the continuous quantum measurement of a two-level system, for example, a double-quantum dot weakly measured by a quantum point contact. In a weak measurement regime, the measurement outcome at each time step is non-deterministic and fluctuates around its mean value. While the stochastic master/Schrödinger equations are commonly used to study the state of the qubit, we propose an alternative formalism – the stochastic path integral – which can compute moments and correlation functions of the measurement outcomes, and the distributions of possible qubit states. By constructing a probability functional of the measurement outcomes in a path integral form, the moments can be computed from perturbative expansions, which can be resumed to exact solutions in some cases. We show that this approach reproduces and extends existing solutions derived using different methods, and introduces a new way to compute conditioned moments and correlation functions. We also show how real-time feedback can be naturally included in this approach.

Areeya Chantasri
Department of Physics and Astronomy, University of Rochester,
Rochester, New York 14627, USA

Date submitted: 25 Oct 2012 Electronic form version 1.4